



National Snow and Ice Data Center
Advancing knowledge of Earth's frozen regions



University of Colorado **Boulder**

Cool Apps: Building Cryospheric Data Applications With Standards-Based Service Oriented Architecture

*Julia A Collins, Ian Truslove, Brendan W Billingsley, Joseph Oldenburg,
Mary Jo Brodzik, Scott Lewis, Miao Liu*



Outline

1. Introduction
2. The Web, circa 2012
3. 3-tier and Service Oriented Architectures (SOA)
4. Service standards
5. NSIDC apps
6. Proposal

INTRODUCTION

Introduction

The National Snow and Ice Data Center (NSIDC) supports research into our world's frozen realms: the snow, ice, glaciers, frozen ground, and climate interactions that make up Earth's cryosphere.

NSIDC manages and distributes scientific data, creates tools for data access, supports data users, performs scientific research, and educates the public about the cryosphere.

Introduction

The National Snow and Ice Data Center (NSIDC) supports research into our world's frozen realms: the snow, ice, glaciers, frozen ground, and climate interactions that make up Earth's cryosphere.

NSIDC manages and distributes scientific data, creates tools for data access, supports data users, performs scientific research, and educates the public about the cryosphere.

Introduction

distributes scientific data

creates tools for data access

supports data users



Introduction

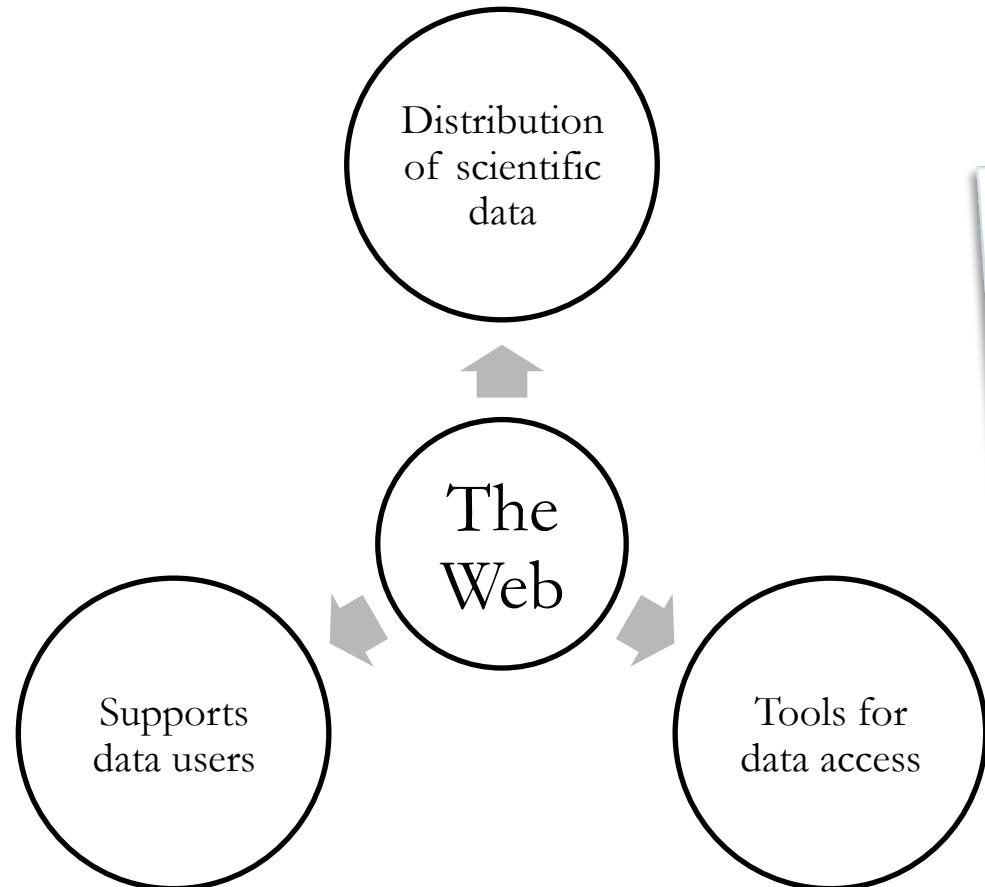
distributes scientific data

creates tools for data access

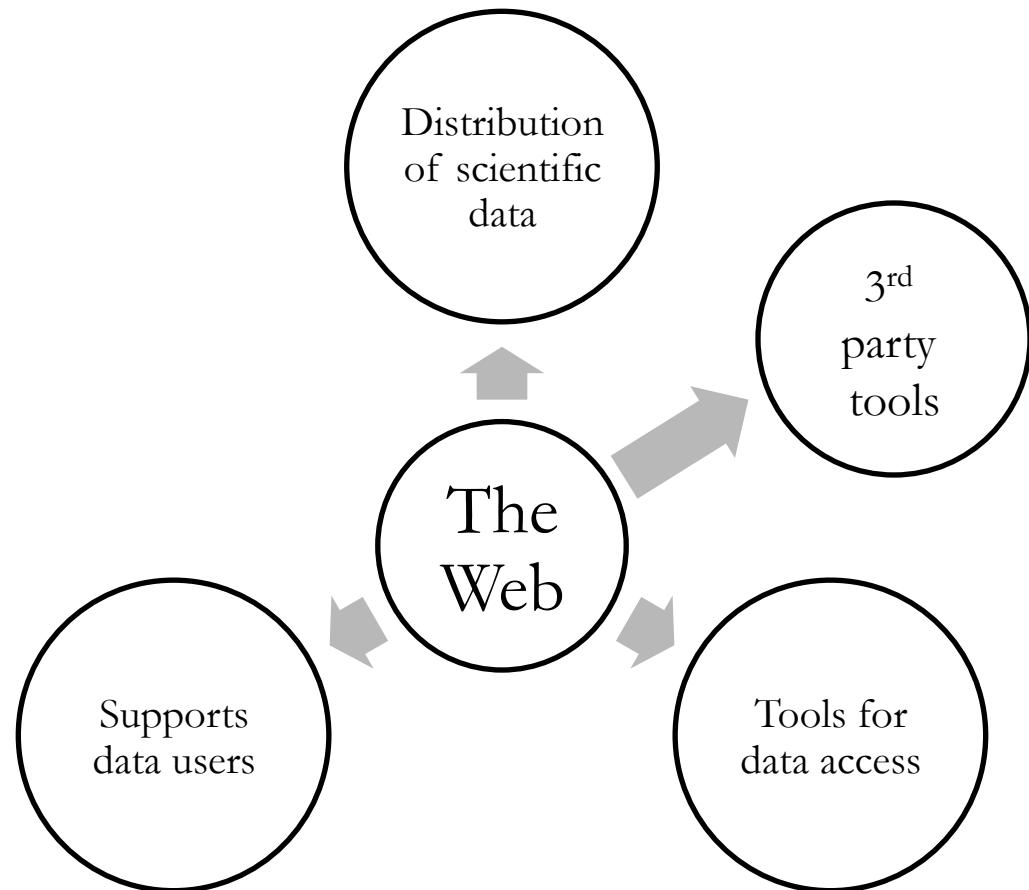
supports data users



Introduction

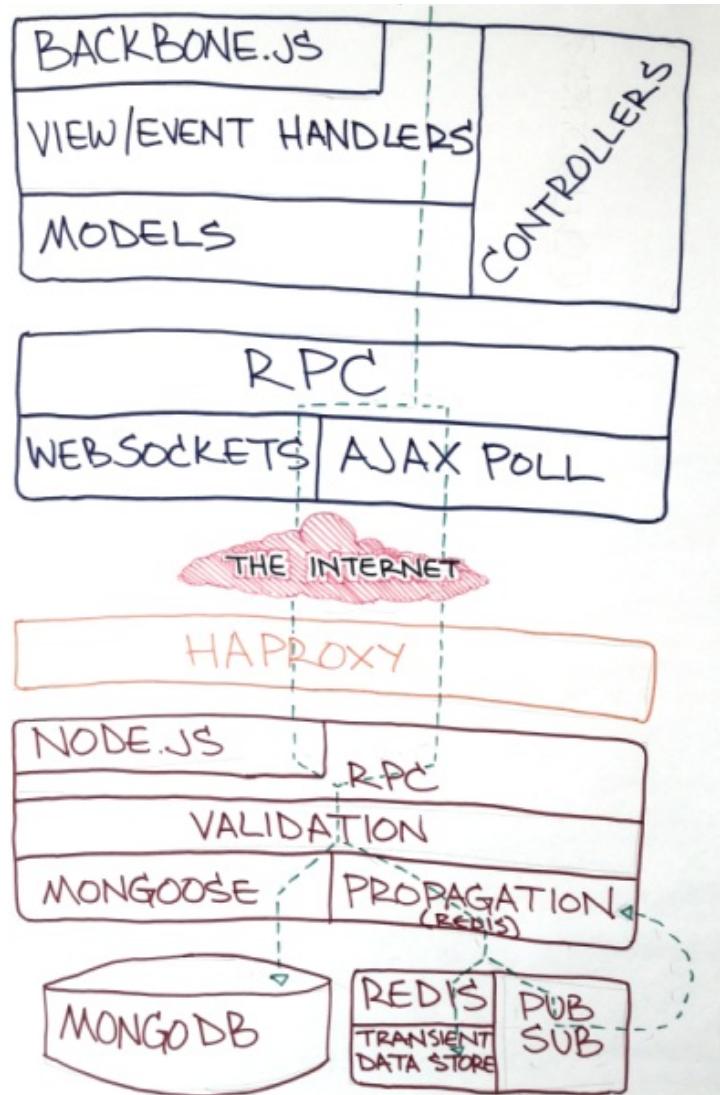


Introduction



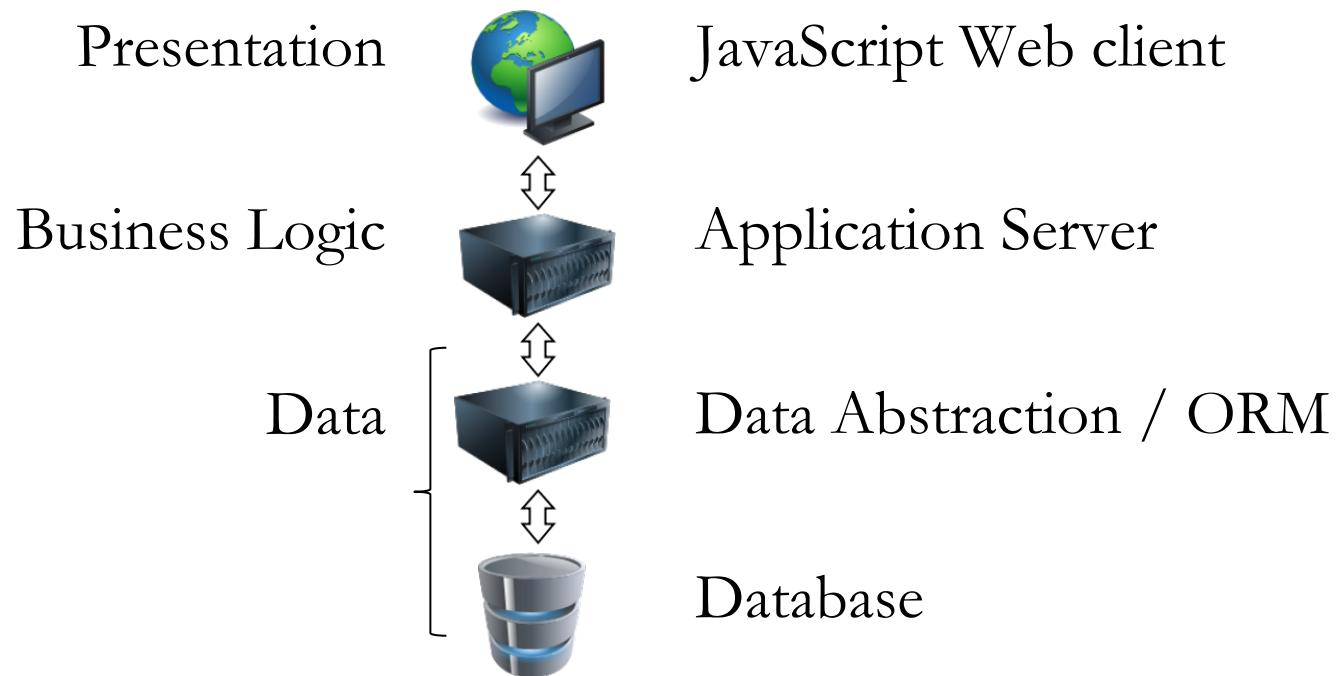
THE WEB

Web Applications



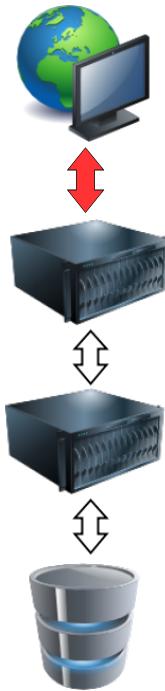
<http://blog.fogcreek.com/the-trello-tech-stack/>

3-Tier Web Architecture

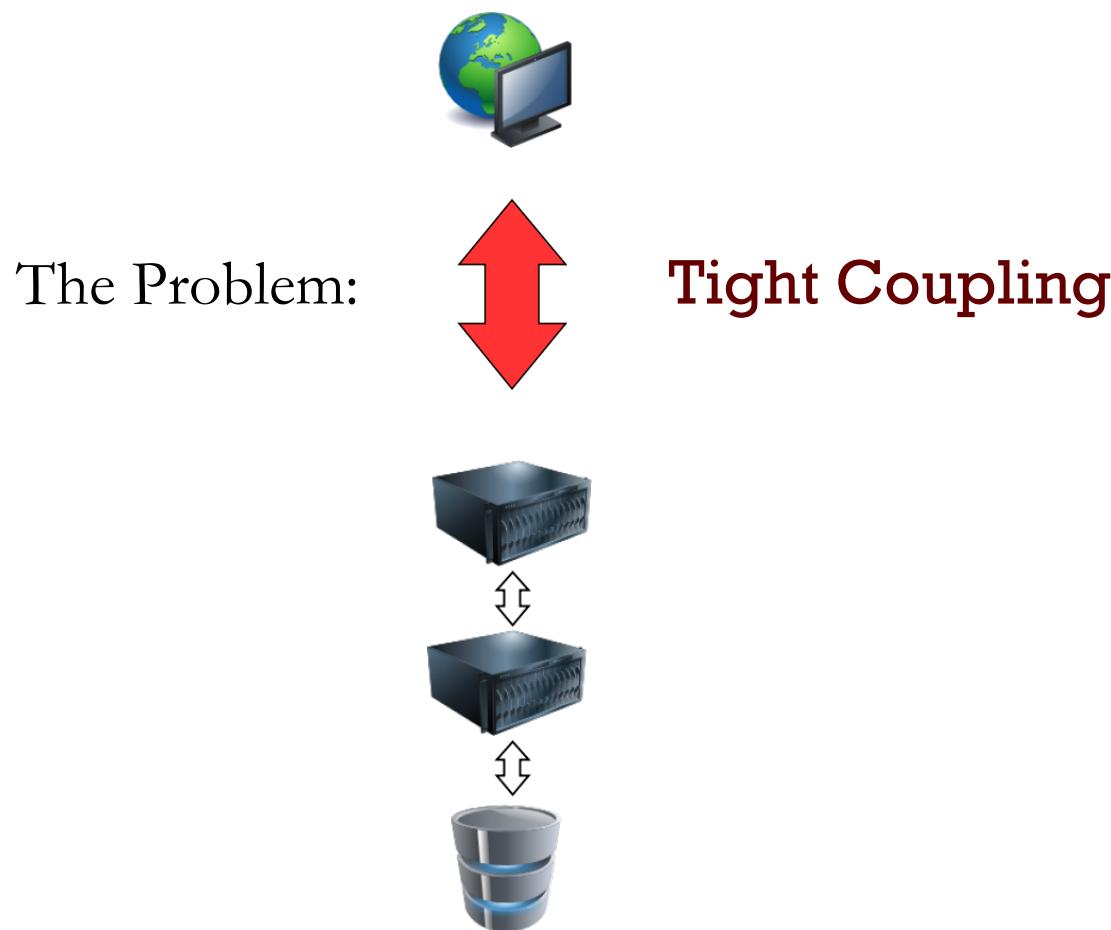


3-Tier Web Architecture

The Problem:



3-Tier Web Architecture



3-Tier Web Architecture

The Problem:

1 user interface requires 1 app stack

3-Tier Web Architecture

The Problem:

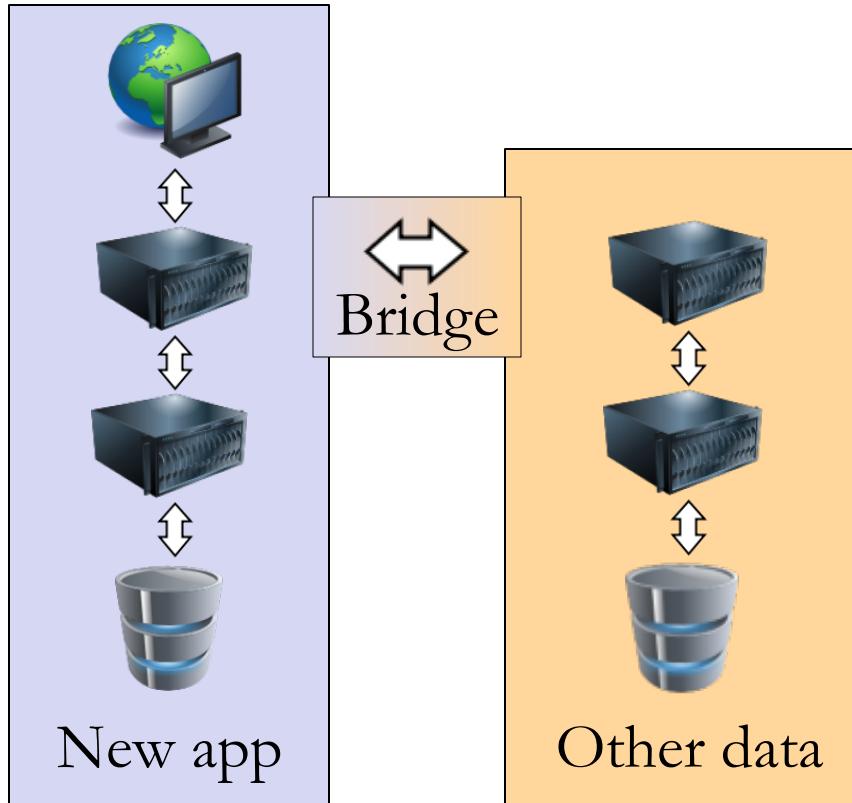
...and perhaps

**portal
proliferation
problem**

3-Tier Web Architecture

Extending...

3-Tier Web Architecture



3-Tier Web Architecture

The Problem:

1 user interface requires ≥ 1 app stack

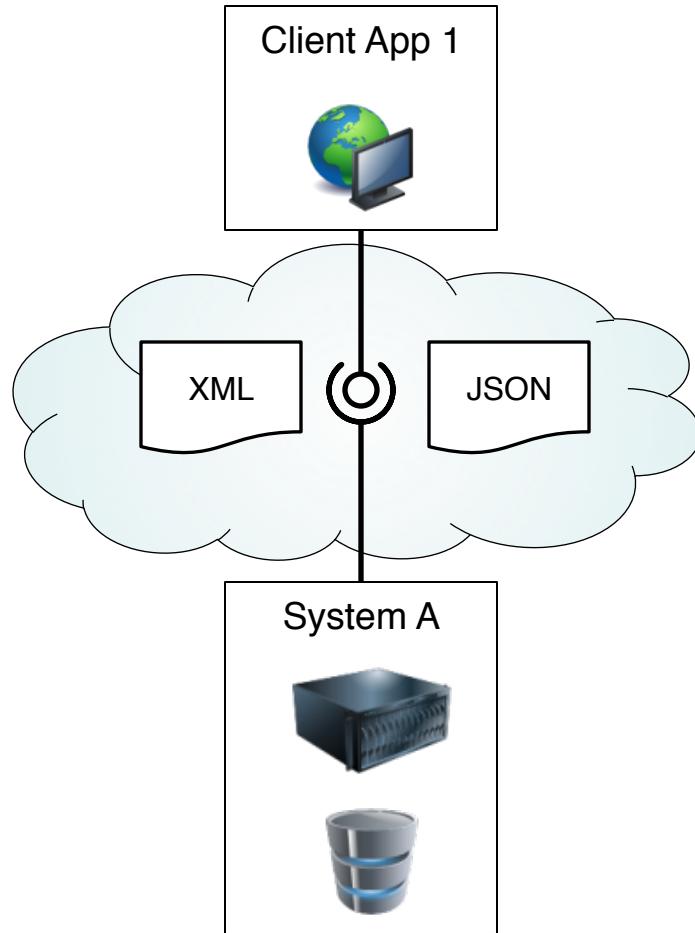
(hopefully in the same language)



Cool Apps: Building Cryospheric Data Applications With Standards-Based Service Oriented Architecture

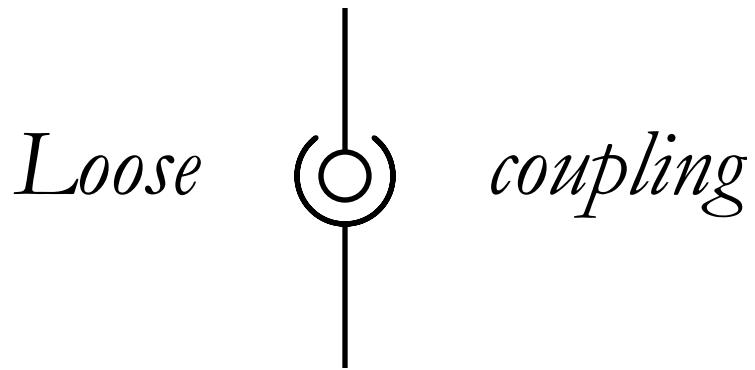


SOA Web Architecture



Service Interfaces

Clients consume service interfaces

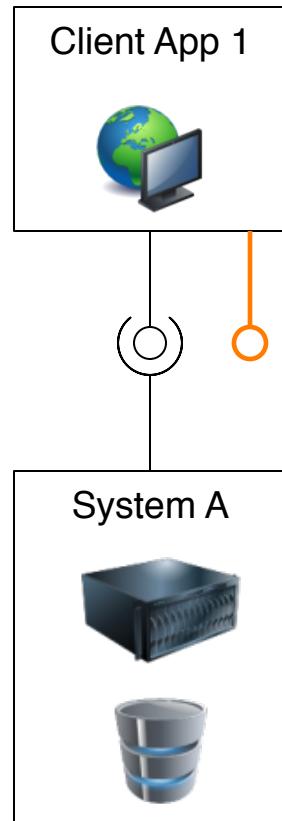


Systems expose service interfaces

Service Interfaces

Extending...

SOA Web Architecture



Service Interfaces

The Problem:

**service interface
proliferation
problem**

Service Interfaces and Standards

Clients consume service interfaces

...service interfaces conforming to
standards

Service Standards

data: OGC WMS, WFS, WPS, ...

OPeNDAP

REST

publishing: ATOM

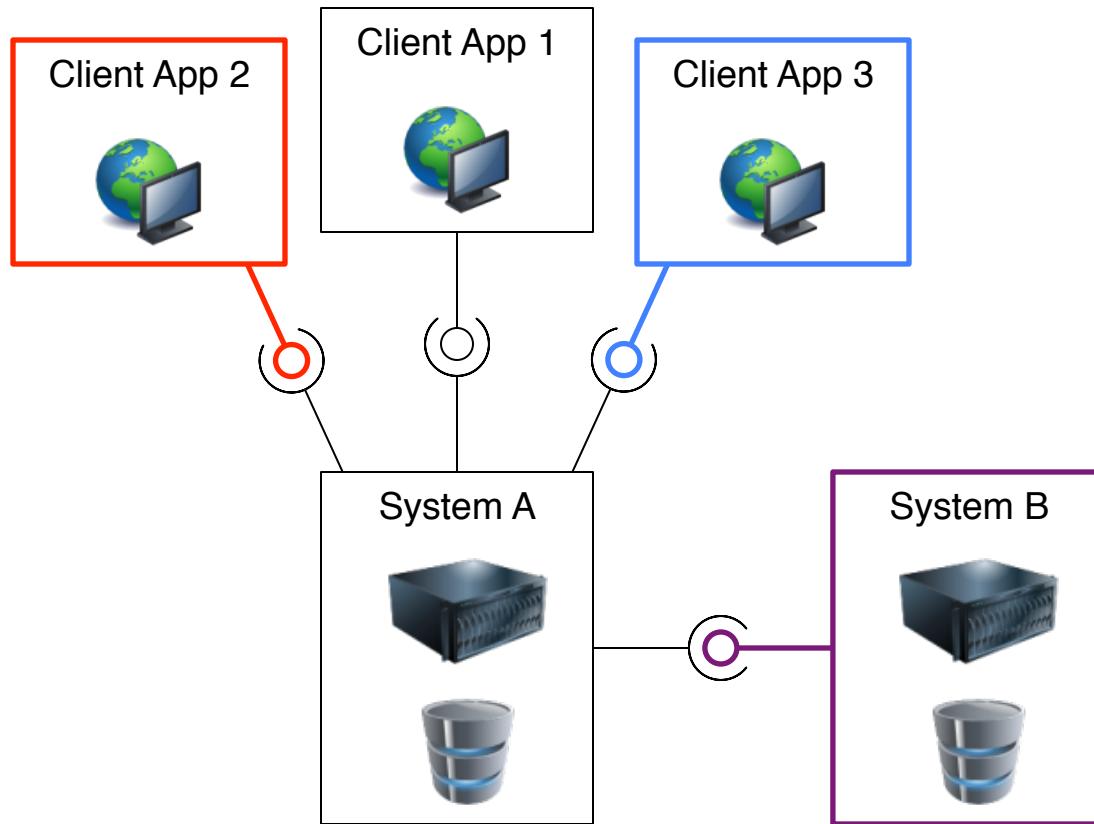
discovery: ESIP OpenSearch

metadata: OAI-PMH

Service Interfaces

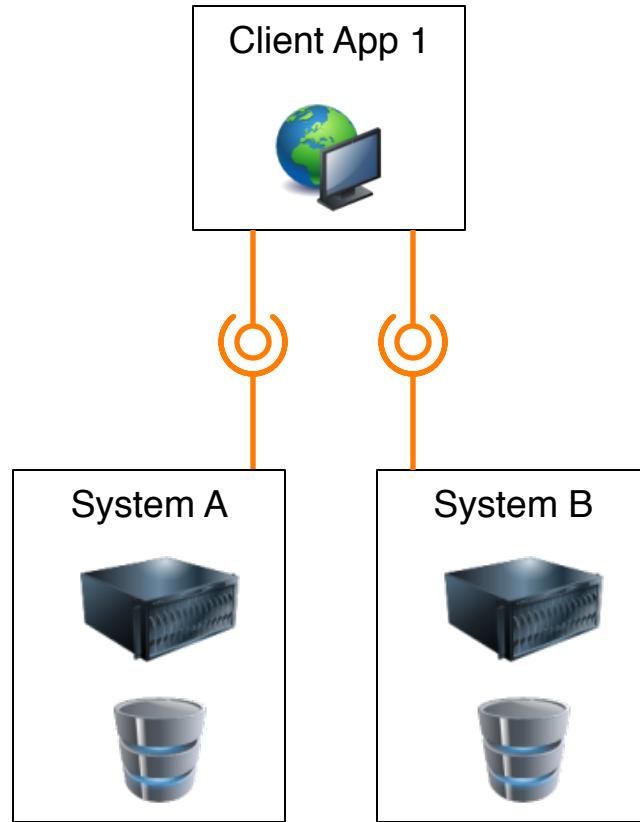
Reusing...

SOA Web Architecture



Many clients...

SOA Web Architecture



Many service providers...

Implementing Services

Adopt

>

Extend

>

Roll your own

Service Standards

**REST IS AN
ARCHITECTURAL
STYLE!**

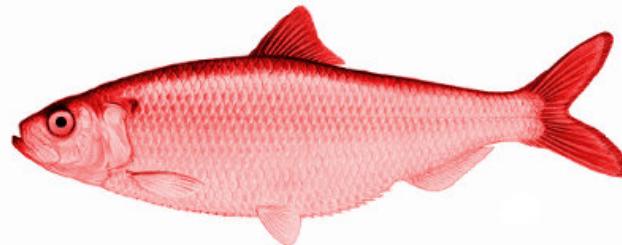
AGU_2012_Cool_Apps.pptx

Service Standards

<i>data:</i>	OGC WMS, WFS, WPS, ...
<i>publishing:</i>	ATOM
<i>discovery:</i>	ESIP OpenSearch
<i>metadata:</i>	OAI-PMH

Cool Apps: Building Cryospheric Data Applications With Standards-Based Service Oriented Architecture

NSIDC



Services: Roll Your Own

Desirable properties include:

Discoverability

Comprehensibility

Universality

Extensibility

Services, RESTfully

Discoverability:

hypermedia constraint, published media types

Comprehensibility:

familiar URIs; media types

Universality:

HTTP transport; XML or JSON payloads

Extensibility:

XML, e.g. ATOM

Implementing Services

Adopt

>

Extend

>



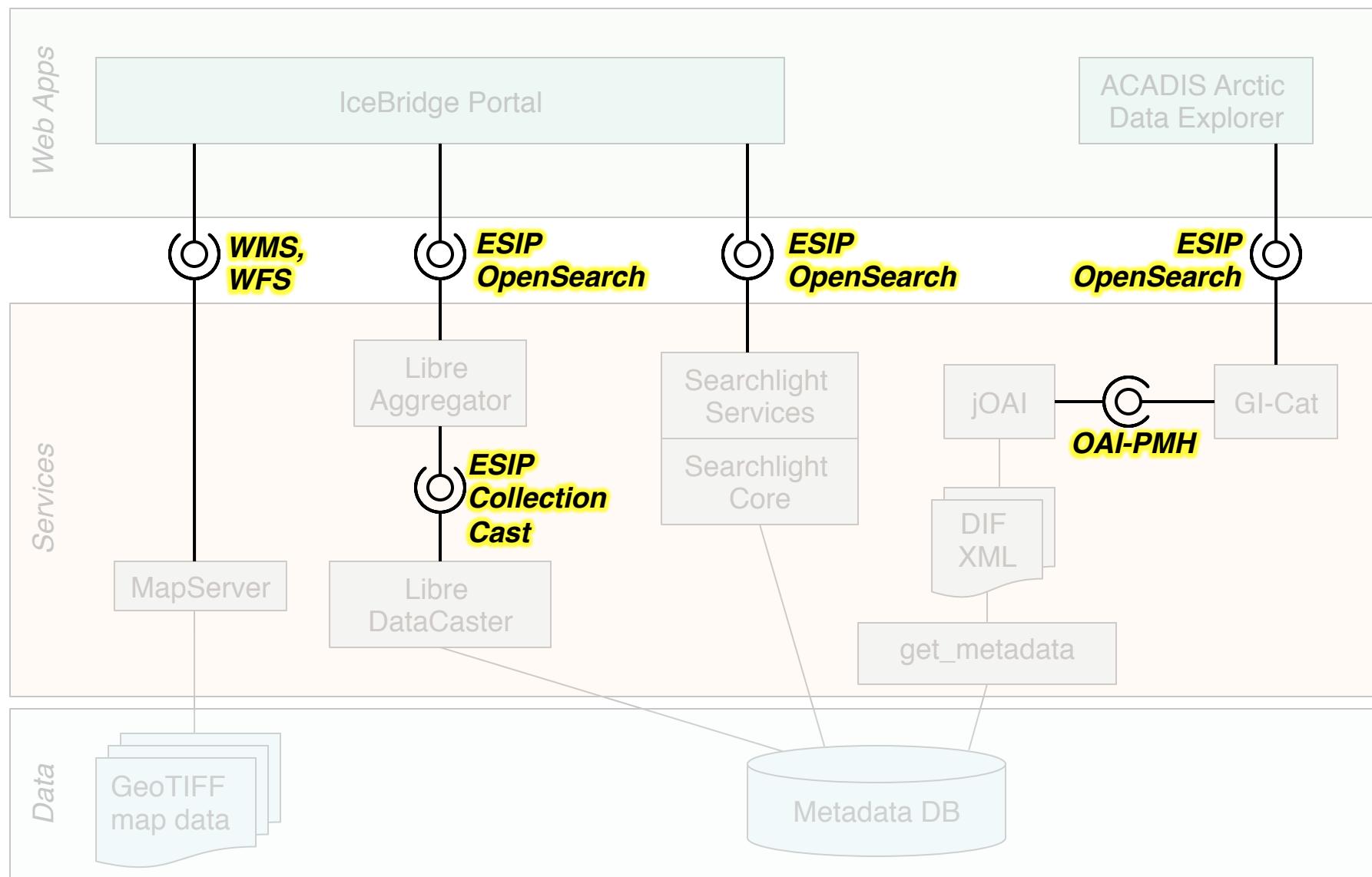
Roll your own RESTful services

SOA @ NSIDC

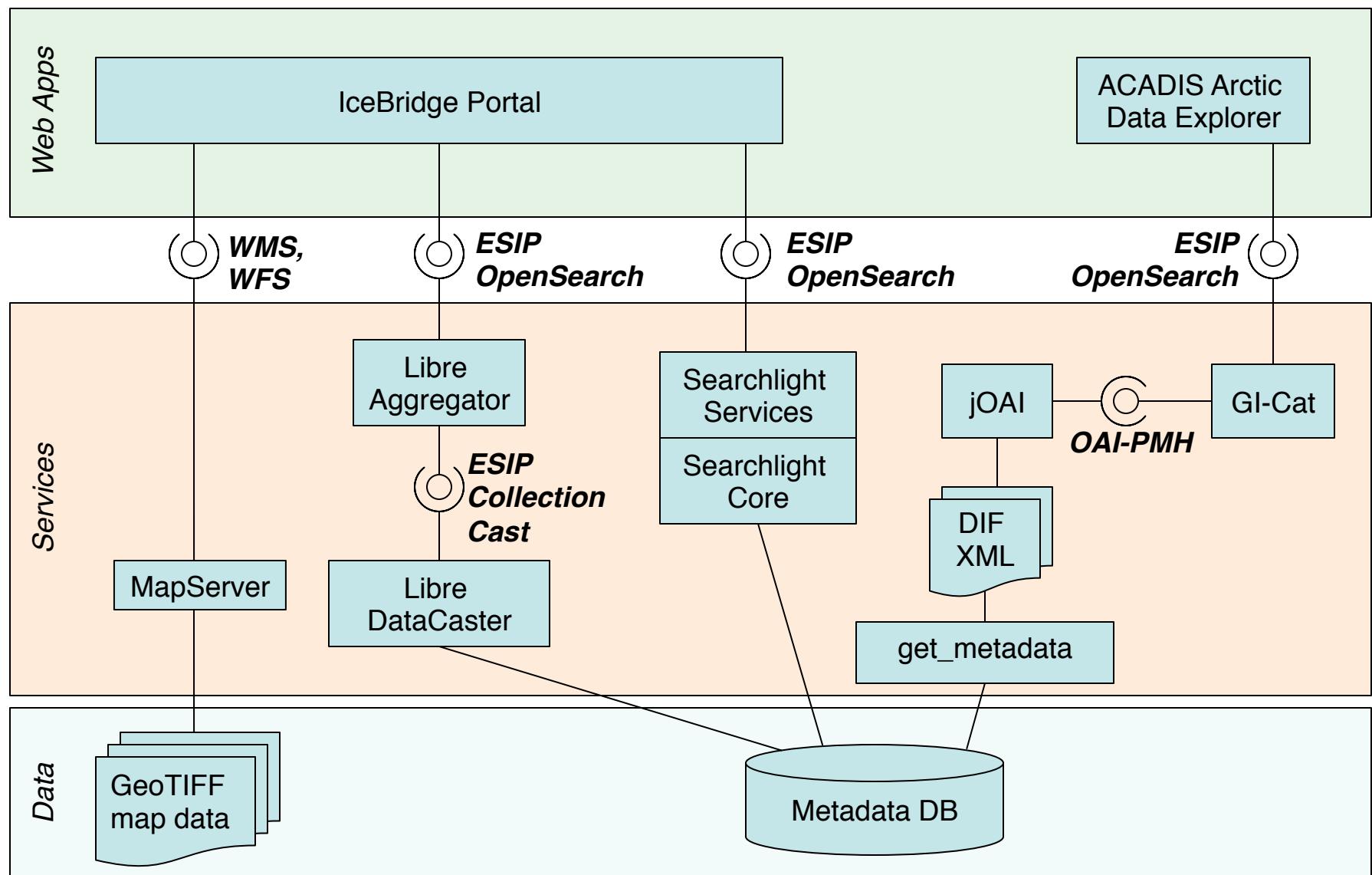
Cool Apps: Building Cryospheric Data Applications With Standards-Based Service Oriented Architecture



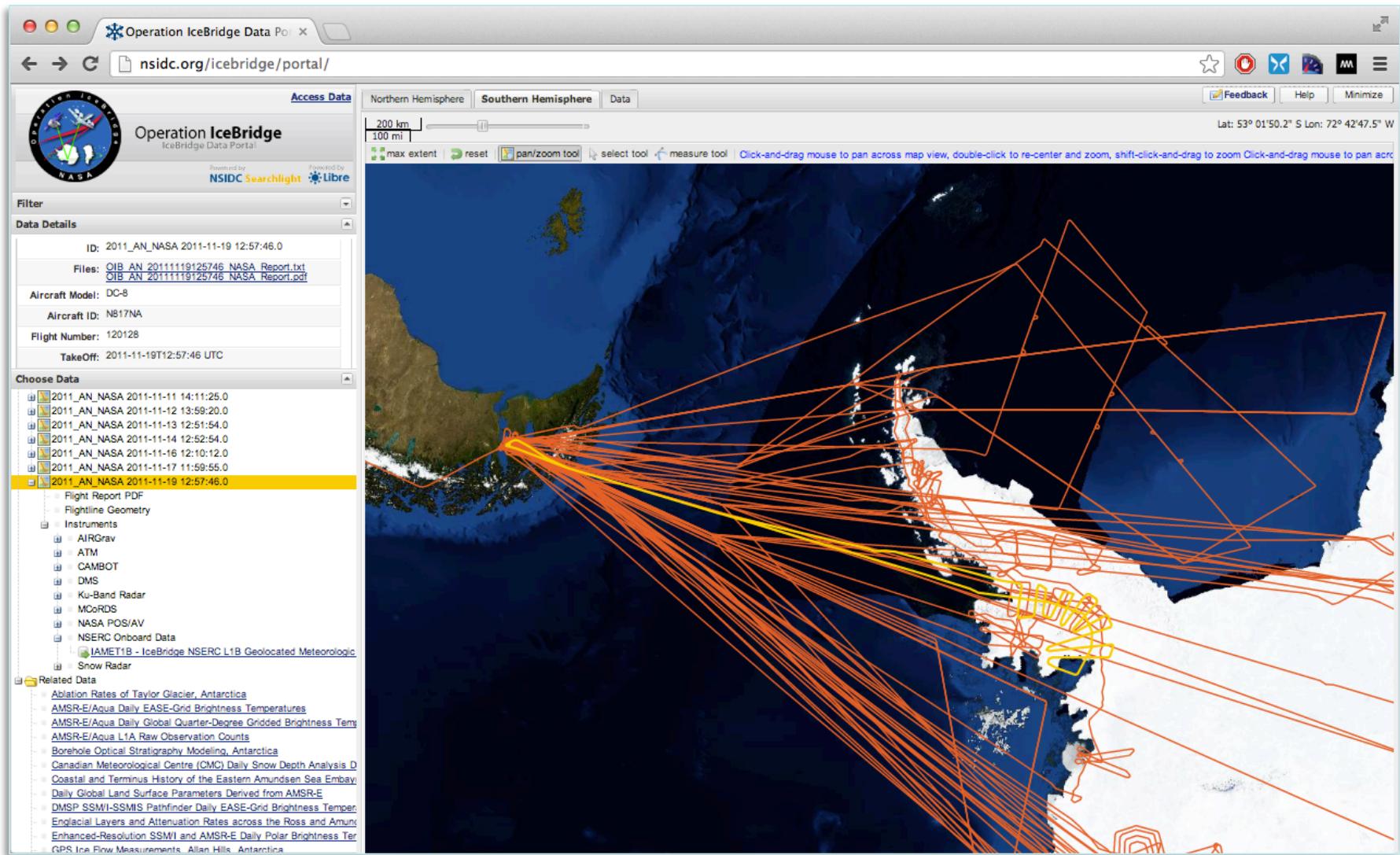
NSIDC's Service Oriented Architecture



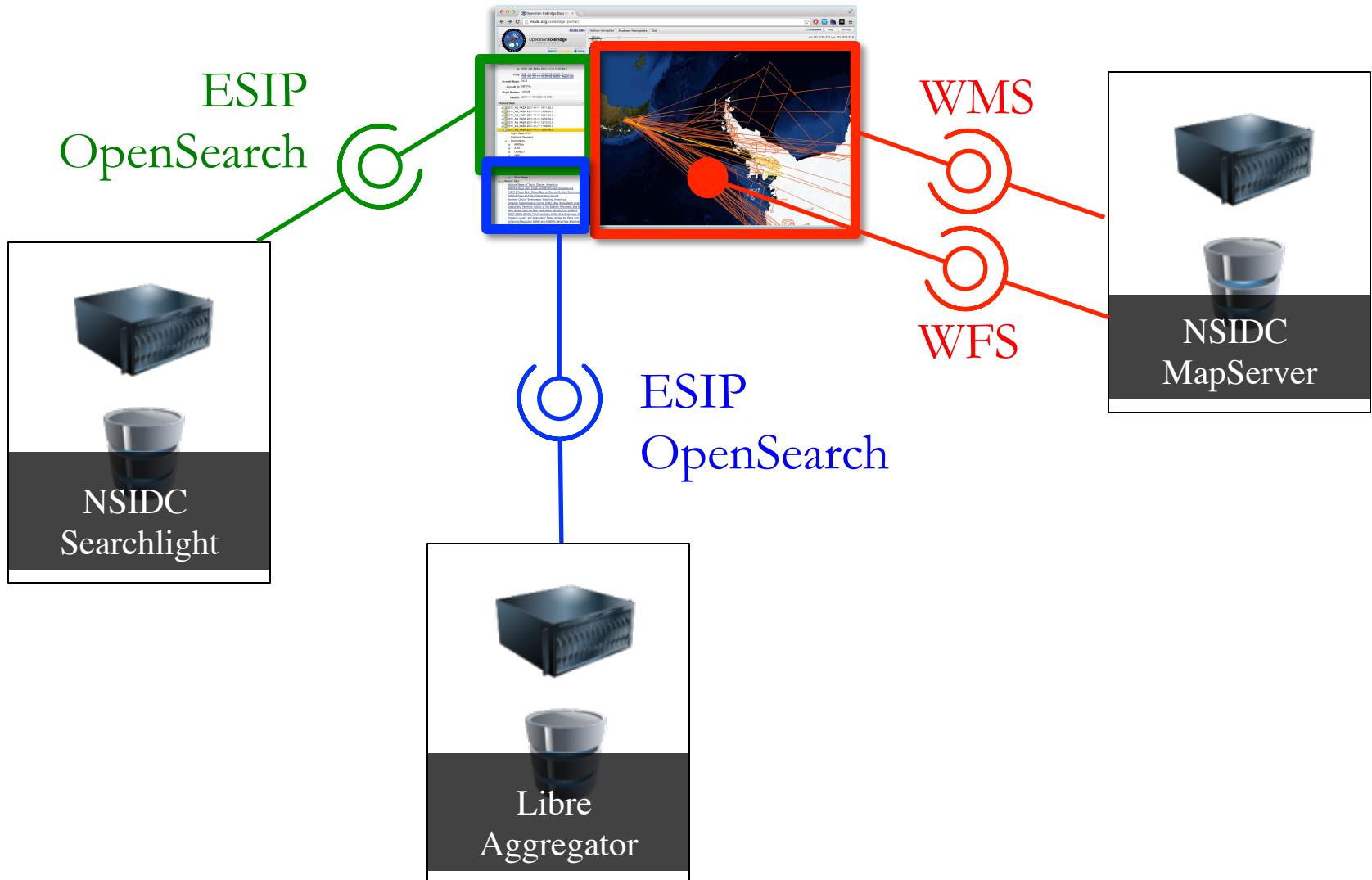
NSIDC's Service Oriented Architecture



Operation IceBridge Portal



Operation IceBridge Portal



ACADIS Arctic Data Explorer

The screenshot shows a web browser window for the ACADIS Search interface at nsidc.org/acadis/search/. The page features a dark blue header with the NSIDC logo and navigation links for HOME, DATA, PROGRAMS, RESEARCH, NEWS, ABOUT THE CRYOSPHERE, and ABOUT US. Below the header is a search bar with fields for Keywords, Spatial Coverage, and Temporal Coverage, along with a "Find Data Now" button. The main content area displays "Search Results (940)" with four listed datasets:

- Monthly Mean Precipitation Sums at Russian Arctic Stations, 1966-1990**
Spatial Coverage Lat: (50.17, 69.77), Lon: (38.25, 164.17)
Temporal Coverage Start Date: not specified, End Date: 1990-12-31
Data Center NSIDC [get data](#)
- Engineering-Geocryological Investigations in the Yamburg and Medvezhje Gas Fields, Russia**
Spatial Coverage Lat: (67.00, 68.00), Lon: (73.00, 76.00)
Temporal Coverage Start Date: 1972-01-01, End Date: 2000-12-31
Data Center NSIDC [get data](#)
- Engineering-geocryological Investigations, Zapolyarnoye-Urengoy, Western Siberia, Russia**
Spatial Coverage Lat: (66.00, 66.83), Lon: (78.00, 80.00)
Temporal Coverage Start Date: 1981-01-01, End Date: 1984-12-31
Data Center NSIDC [no data link](#)
- MODIS/Aqua Snow Cover Daily L3 Global 0.05Deg CMG, Version 4**
Spatial Coverage Lat: (-90.00, 90.00), Lon: (-180.00, 180.00)
Temporal Coverage Start Date: 2002-07-04, End Date: 2006-12-31
Data Center NSIDC [get data](#)

At the bottom of the page, there is a footer note: "Nimbus_E ECMD Polar Gridded Sea Ice Concentrations".

ACADIS Arctic Data Explorer



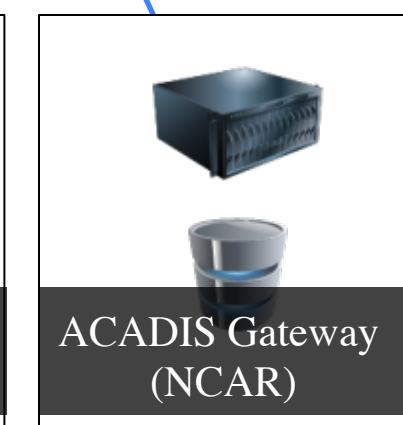
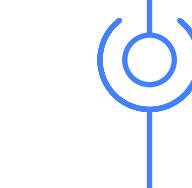
ESIP OpenSearch



OPeNDAP



OAI-PMH



$+/-\Delta$: OBSERVATIONS

Disadvantages

Complexity
Compromise
Development time

Advantages

Reuse (and reusability)
Off-The-Shelf Software
Development time

Challenges

Documentation Adoption Continuity

THE WEB OF SERVICES

The Web of Services

Clients consume service interfaces



The Web of Services

Web clients...



The Web of Services

Web browsers have security restrictions...
("same origin policy")



The Web of Services



**My web client
may not consume
your service interface**

```
JS  
function formSubmit()  
{  
  if (document.getElementById("form").submit())  
    return false;  
}
```



A MODEST PROPOSAL

Goal

Increase the pool
of potential users
(web applications)
of our data



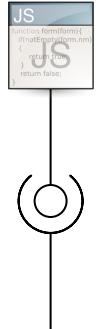
HTML5 Standard: CORS

CORS: Cross Origin Resource Sharing

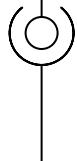
<http://www.w3.org/TR/cors/>

<http://enable-cors.org/>

Proposal



Write service-enabled clients



Build standards-based services



Enable CORS



Share and reuse data and services



Joe Oldenburg: “Cool Apps”

IN43B-1517

Questions



Write service-enabled clients



Build standards-based services



Enable CORS



Share and reuse data and services

me: ian.truslove@nsidc.org

@iantruslove

this presentation: <http://goo.gl/xkxgd>